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THE COCO PALM

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FIELD MUSEUM OF NATURAL HISTORY
DEPARTMENT OF BOTANY
CHICAGO, 1922

LEAFLET NUMBER 2

The Coco Palm

The coco palm grows along tropical shores throughout the world. Its origin has at times been ascribed to the western hemisphere where it is found in places on the west coast of Central and South America, but it is more likely that it belongs originally rather to the East Indian Archipelago and Oceania. Its cultivation in any case probably originated in southeastern Asia where many varieties of it exist and where its uses are more thoroughly appreciated than in the American tropics.

The fruits of the coco palm float and are readily transported by the sea. They will germinate even after a lengthy immersion in salt water, which helps to account for its wide distribution. On the smaller Oceanic Islands it constitutes the most important part of the vegetation and together with a few wild strand plants, perhaps the most constant and characteristic. It is however seldom encountered except in a state of cultivation. As an escape it may be one of the first of waterborn plants to arrive on newly elevated land or reef. On a volcanic island in Polynesia, visited four years after its appearance by the British man-of-war Egeria, the vegetation was thus found to consist of two young coconut palms and three other plants. Preferring the loose soil of sandy beaches it is mostly confined to them though in places it is grown away from the shore and even at a not inconsiderable altitude. In the Philippines it is said to have been planted

up to 5,000 feet but above 1,500 to 2,000 feet, it fails to flourish.

To the traveler its tall cylindrical trunk, slightly curved near the base, often sixty to eighty or more feet in height, seems to impart as nothing else a tropical character to the landscape. Few tropical trees can surpass it in utility. In some of the regions where it grows it supplies to the inhabitants almost all the necessaries of life.

The coco palm differs so greatly from any of the trees of our temperate zone that its habit of growth and its manner of flowering and fruiting are of considerable interest. It is always produced from seed. For this purpose the mature coconuts are set out to sprout in beds on the ground, ordinarily under partial shade. The East Indian hangs them in baskets or ties them to poles or to the limbs of a tree. They are never embedded entirely in the soil till ready to plant, which is in about a year, when the roots have penetrated the husk and the first leaves have appeared. The young plants are then set out some fifteen to twenty-five feet apart. During the early years of its life the coco palm does not differ greatly in general appearance from several of our small hot-house palms. Leaves of moderate size arise from near the ground and for some time there is scarcely any visible promise of the future lofty trunk. The first leaves are entire as they appear, and do not, like the later ones, split immediately into the characteristic feathery laminae. It is only after the first few dozen leaves have been shed and the cylindrical, woody stem becomes visible that the plant begins to acquire its characteristic aspect, which is complete when flowering commences in about the sixth to eighth year. The coco palm matures in twenty to forty years and continues to bear almost continuously for sixty to eighty years longer.

The growing point of the tree is at the apex. The terminal bud is always present, enveloped and shielded by the bases of several young and unexpanded leaves that make up the top of the plant. The flower-buds are situated in the leaf-axils, one to each leaf. A flower-bud on its first appearance is two or three feet long, cylindrical and tapering. Its green color is due to an enveloping sheath, the spathe. As the bud swells with growth it bursts its envelope, the spathe splitting lengthwise, revealing the flowering spike of a pale straw color. In a few days this has freed itself from its spathe and has become a fully expanded branching spike, in general shape much like a gigantic corn tassel. Each of its twenty to thirty branches is closely set with prismatically compressed, small buds of a pale straw color and of a horny texture. These are the buds of the male flowers and soon begin to open, usually a few at a time on each branch, after which they fall off. Eventually there remains on the flowering spike only the female flowers, each of the size of a horse-chestnut and from the very first roughly indicative of the shape of the fruit. While the male flowers are rather perfect with free floral leaves, six stamens and a rudimentary three-parted pistil, the female coco palm flower seems to have suppressed all frills to devote itself from the beginning exclusively to the production of coconuts. The male flowers are insect-visited, but the palm is apparently wind-pollinated. Within a short time the young coconuts look much like huge, green acorns. They grow rapidly and in about a year they have attained their full dimensions. As the coconut matures, the outer envelope begins to turn brown and to shrink. With the shrinkage the well-known, roughly triangular shape of the fruit becomes emphasized.

A full-sized fruit cluster consists of twelve to

twenty coconuts. The flowering continues the year around and a tree in prime condition yields upwards of 100 fruits annually, distributed over four or five harvests. The record in the Philippines is 470 nuts from a tree.

The leaves of the coco palm are attached directly to the main stem. They are commonly twenty feet or more in length. They are shed one by one as the fruit clusters mature and drop, or are removed, so that the clusters of ripe fruit are always associated with the lowermost leaves. Each leaf-base with its sheath completely encircles the central trunk, the characteristic ridges or roughness of which are due to the old leaf-scars. The dry bast-like leaf sheathes may be seen surrounding the bearing portion of the trunk. Split and partially torn away from their respective leaf bases, they give it an untidy appearance. Their presence is puzzling to account for, till one observes them in position on the topmost leaves. There they serve to tie together the bundle of young leaves surrounding the growing tip, a matter of great importance to the tree in regions subject to severe winds.

The near-ripe fruit of almost full size, but still green, contains a fluid, slightly milky in appearance and sub-acid, the "coconut milk," or "water," which furnishes a pleasant drink. To obtain it, one must cut through the outer fibrous tissue, then the inner dense and hard layer which, like an egg shell, surrounds the embryo plant with its stored food-material. At an early stage this forms only a thin gelatinous layer within the shell, the remainder being the fluid "milk." As the coconut ripens the layer of "endosperm," the botanical term for this food material, becomes thicker and of firm consistence and the water more like milk.

In some places a drink is obtained from the coco

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palm in another manner. The stem and branches of the flower spike are tied into a bundle and cut, and over the cut end is fixed a vessel consisting of a length of bamboo. The sap which would ordinarily go to the formation of the cluster of fruit is obtained in this way. The bamboo is emptied each day, the collector sometimes passing by aerial bridges from tree to tree. The fermented juice is variously known as "tuba" or "toddy." Eleven million gallons of it were produced in the Philippines in 1913.

The main product of the tree is, however, the white meat of the coconut. The mature nuts are allowed to fall naturally or are gathered four or five times a year by pulling them down with hooks or by climbing the trees when situated too high to be reached from the ground. They are collected into piles and husked by beating against the sharpened end of a stake or iron point fixed upright in the ground. They are then split with a bush knife or cleaver and are left in the sun to dry somewhat, which loosens the white coconut meat from the shell. The dried meat is known as "copra." It constitutes an important article of commerce. Dessicated and grated it forms the shredded coconut of the confectioners, but its principal value depends on its oil content, fifty per cent or more by weight. The oil is obtained from the copra by pressure. The remaining "cake" is a valuable fodder. The coconut oil is at ordinary temperature, a soft, white fat of somewhat objectionable taste and odor. It has always been highly esteemed as a fat for soap making, but its present-day, more important use dates from the discovery that the addition of an atom of hydrogen to the molecule of fat renders it perfectly bland and comestible. (See Slosson, "Creative Chemistry" for an account of vegetable fats.) It is now widely used in the preparation of butter substitutes and is consumed

in large quantities in France and Germany. The United States imported in the month of September of 1921, 3,000,000 pounds of husked coconuts and copra. The normal monthly European consumption is at least fifteen to twenty times as great. The production is capable of almost indefinite expansion.

The husk of the coconut is also of considerable value. It furnishes a fibre known as coir (pronounced *kir,* Portuguese *cairo* from Malayalam *kayar,* rope, cord) and is one of the principal brush, belting, matting and rope making materials. Cordage made from it is rough, but light and has the virtue of floating which is advantageous for certain purposes, as for ship's cables. Even paper has been made from coir, at least one factory for the purpose existing in the Straits Settlement. Certain species of coconut are especially cultivated for coir, since they yield large quantities of fibre. Coir and copra production are, however, almost mutually exclusive—copra requiring the mature fruit while a good quality of coir must be made from the green husk.

The wood of the coco palm is known as "porcupine wood." It is furnished only by the outer part of the cylindrical trunk, the central core being simply fibrous. Its usefulness is rather limited and restricted mostly to regions where it grows. The bast-like leaf sheaths are used for native clothing, the leaves for plaiting and thatching, the fibrous core of the trunk, for cordage and brushes, in fact every part of this tropical tree is utilized. From the inner shell of the nut, dippers, cups and other vessels are easily fashioned. The Museum displays a varied collection of these as well as of all other coconut products, such as oil, sugar, candles, cordage, brushes, mats.

The Dutch East Indies, Ceylon, Straits Settlements, Philippines, India, Zanzibar, South America

and West Indies are the chief producing and exporting countries in order of their importance. The Philippines, for instance, produce annually about a billion nuts, 150 millions of which are consumed locally, and the remainder exported. The value of the exports in 1913 was fifteen to twenty million dollars. A ton of copra, the product of about 5,000 nuts, brought them about $100. Large coco palm plantations often twenty to 100,000 acres in extent, are being established in various parts of the world to keep pace with the demand which is increasing with the decline in the supply of animal fats. The coconut supply to the United States has hitherto come chiefly from the American tropics, Central America, Colombia, Brazil, and the West Indies. The trees in this region are lately threatened by a fungus disease, the so-called "bud-rot," which has gained a foot-hold. A few coco palms are grown in the United States, mostly for ornamental purposes, on the east coast of Florida and along the Gulf. The Museum specimen is a reconstruction within the limitations of an exhibition case, of the bearing portion of a South Florida palm in a well developed stage.

B. E. DAHLGREN.

The exhibits in the Field Museum pertaining to the Coconut palm and its economic products are to be found in the Department of Botany, Halls 25 and 28 on the second floor.

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